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SUCHECKI, KRYSTYNA

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/603,379	NICOLAESCU ET AL.	
	Examiner	Art Unit	
	Krystyna Suchecki	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-30 is/are pending in the application.

4a) Of the above claim(s) 22-27 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-12,14-21 and 28-30 is/are rejected.

7)☒ Claim(s) 13 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 10/24/03 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claims 22-27 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 12/20/04.

2. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the combination of claim 18 having an optical modulator in combination with a 1 x 2 optical switch must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

4. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the

drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

5. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: Claim 18 recites limitations wherein 1x2 optical switches are combined with first and second optical waveguides with first and second polarization modes such that modulators interpose a coupling region, between the waveguides, and the optical switches. There is insufficient antecedent basis for this limitation in the claim. The disclosure has antecedence for optical switches appearing after a coupling region between two optical waveguides. The addition of modulators is not shown in the specification.

Claim Objections

6. Claim 1 is objected to because of the following informalities: Claim 1 recites that a single area has two separate lengths, but fails to recite a means or configuration to change the coupling length of the coupling region. Applicant has disclosed means to change the length, and that the length change cannot occur without some material between the first and second waveguide to change lengths when acted on by an electrode. Appropriate correction is required.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1, and 4 are rejected under 35 U.S.C. 102(e) as being anticipated by Takabayashi (US 2004/0101227).

9. Regarding Claim 1, Figure 13 of Takabayashi teaches an apparatus, comprising: a first optical waveguide (P51, 21) disposed in a semiconductor material layer; a second optical waveguide (P52, 22) disposed in the semiconductor material layer (Paragraph 90); and an insulating region disposed between the first and second optical waveguides to provide a coupling region in the semiconductor material layer between the first and second optical waveguides, the coupling region having a first coupling length for a first polarization mode of an optical beam directed through one of the first and second optical waveguides into the coupling region, the coupling region having a second coupling length for a second polarization mode of the optical beam (Paragraph 124; see also Figure 1).

10. Regarding Claim 4, Takabayashi teaches an apparatus wherein the semiconductor material layer includes silicon (Paragraph 90).

11. Claims 1, 2, 5-12, 14-17, 19-21 and 28-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Thanyavarn (US 2002/0025103).

12. Regarding Claims 1 and 11, Thanyavarn teaches an apparatus and method, comprising: a first optical waveguide (upper waveguide) disposed in a semiconductor material layer; a second optical waveguide (lower waveguide) disposed in the semiconductor material layer (Paragraph 49); and an insulating region disposed between the first and second optical waveguides to provide a coupling region in the semiconductor material layer between the first and second optical waveguides, the coupling region having a first coupling length for a first polarization mode of an optical beam directed through one of the first and second optical waveguides into the coupling region, the coupling region having a second coupling length for a second polarization mode of the optical beam (Paragraphs 49-50).

13. Regarding Claim 2, Figure 3A of Thanyavarn teaches the apparatus of claim 1 wherein the first polarization mode (TE) of the optical beam is directed out from the coupling region through the first optical waveguide and the second polarization mode (TM) of the optical beam is directed out from the coupling region through the second optical waveguide (Paragraph 52).

14. Regarding Claim 5, Thanyavarn teaches an apparatus wherein the insulating region includes an oxide (Paragraph 49).

15. Regarding claim 6, Thanyavarn teaches the apparatus of claim 1 wherein the first and second optical waveguides comprise single mode optical waveguides (Paragraph 52).

16. Regarding Claims 7 and 12, Thanyavarn teaches the apparatus and method wherein said optical beam directed through said one of the first and second optical waveguides into the coupling region comprises unpolarized light (Figure 3A, axial input beam representation).

17. Regarding Claim 8, Thanyavarn teaches the apparatus of claim 1 wherein the coupling region comprises two single mode asymmetric waveguides separated by the insulating region,

the two single mode asymmetric waveguides including the first and second optical waveguides (Pragraphs 48, 52).

18. Regarding claim 9, Thanyavarn teaches the apparatus of claim 1 further comprising modulated charge layers proximate to the insulating region in the coupling region to adjust the first and second coupling lengths (Paragraphs 49-50, 54-55).

19. Regarding Claim 10, Thanyavarn teaches the apparatus of claim 1 wherein the first polarization mode of the optical beam comprises a transverse magnetic field (TM) mode of the optical beam and the second polarization mode of the optical beam comprises a transverse electric field (TE) mode of the optical beam (Paragraphs 52-55).

20. Regarding Claim 14, Thanyavarn teaches a method, further comprising modulating an electric field across the insulating region disposed between the first optical waveguide and a second optical waveguide disposed in the semiconductor substrate layer to adjust a first coupling length for the first polarization mode of the optical beam directed into the coupling region and to adjust a second coupling length for the second polarization mode of the optical beam directed into the into the coupling region (Paragraphs 49-55).

21. Regarding Claim 15, Thanyavarn teaches the method of claim 11 further comprising: modulating the first polarization mode of the first optical beam with a first optical modulator disposed in the semiconductor material layer; and modulating the second polarization mode of the second optical beam with a second optical modulator disposed in the semiconductor material layer (Paragraph 53, section 344 of Figure 3A).

22. Regarding Claim 16, Thanyavarn teaches the method of claim 15 further comprising combining the modulated first polarization mode of the first optical beam with the modulated

second polarization mode of the first optical beam into a modulated first optical beam (See output of Figure 3A).

23. Regarding claim 17, Thanyavarn teaches the method of claim 16 wherein combining the modulated first polarization mode of the first optical beam with the modulated second polarization mode of the first optical beam into the modulated first optical beam comprises: directing the modulated first polarization mode of the first optical beam through the first optical waveguide into a second coupling region defined in the semiconductor material layer, the second coupling region including a second insulating region disposed between the first and second optical waveguides in the semiconductor material layer; directing the modulated second polarization mode of the first optical beam through the second optical waveguide into the second coupling region (See Figure 3A and 3B and Paragraph 60).

24. Regarding Claim 19, Figures 3A and 3B of Thanyavarn teach an apparatus, comprising: a first polarization beam splitter/combiner (342) through which an optical beam is to be directed; a first optical modulator (350, 352) coupled to the first polarization beam splitter/combiner to receive a first polarization mode of the optical beam; a second optical modulator (354, 352) coupled the first polarization beam splitter/combiner to receive a second polarization mode of the optical beam; and a second polarization beam splitter/combiner (346) coupled to the first and second optical modulators to receive and combine modulated first and second polarization modes, respectively, of the optical beam into a modulated optical beam, the first and second polarization beam splitters and the first and second optical modulators disposed in a semiconductor material layer. [The modulators are in the semiconductor layer since the electric

field lines from the electrodes modulate the waveguide material, and the electric field lines reach into the semiconductor material. See also Paragraph 54-55]

25. Regarding Claim 20, (Figure 3A) Thanyavarn teaches the apparatus of claim 19 wherein each of the first and second polarization beam splitters/combiners comprises: a first optical waveguide disposed in the semiconductor material layer (upper waveguide); a second optical waveguide disposed in the semiconductor material layer (lower waveguide); and a insulating region disposed between the first and second optical waveguides to provide a coupling region in the semiconductor material layer between the first and second optical waveguides, the coupling region having a first coupling length for the first polarization mode of the optical beam directed through one of the first and second optical waveguides into the coupling region, the coupling region having a second coupling length for a second polarization mode of the optical beam (Paragraphs 51 and 66).

26. Regarding Claim 21, Thanyavarn teaches the apparatus of claim 19 wherein each of the first and second polarization beam splitters/combiners further comprises modulated charge layers proximate to the insulating region in the coupling region to adjust the first and second coupling lengths (Paragraphs 54-55).

27. Regarding Claim 28, Figure 3a and 3B of Thanyavarn teach a system, comprising: an optical transmitter (source of axial representation of input signal) to output an optical beam; an optical receiver (at exit point) coupled to receive the optical beam; and an polarization insensitive optical modulator (Paragraph 48 and area 344) coupled between the optical transmitter and the optical receiver to modulate the optical beam, the polarization insensitive optical modulator including: a first polarization beam splitter/combiner (area342) through which

the optical beam is to be directed; a first optical modulator (350, 352) coupled to the first polarization beam splitter/combiner to receive a first polarization mode of the optical beam; a second optical modulator (354, 352) coupled the first polarization beam splitter/combiner to receive a second polarization mode of the optical beam; and a second polarization beam splitter/combiner (area 346) coupled to the first and second optical modulators to receive and combine modulated first and second polarization modes, respectively, of the optical beam into a modulated optical beam, the first and second polarization beam splitters and the first and second optical modulators disposed in a semiconductor material layer (Paragraphs 53-55, 60).

28. Regarding Claim 29, Thanyavarn teaches the system of claim 28 wherein each of the first and second polarization beam splitters/combiners comprise: a first optical waveguide (upper waveguide) disposed in the semiconductor material layer; a second optical waveguide (lower waveguide) disposed in the semiconductor material layer; and a insulating region disposed between the first and second optical waveguides to provide a coupling region in the semiconductor material layer between the first and second optical waveguides, the coupling region having a first coupling length for the first polarization mode of the optical beam directed through one of the first and second optical waveguides into the coupling region, the coupling region having a second coupling length for a second polarization mode of the optical beam (Paragraphs 51, 60, 61, 66).

29. Regarding Claim 30, Thanyavarn teaches the system of claim 29 wherein each of the first and second polarization beam splitters/combiners further comprises modulated charge layers (E_y) proximate to the insulating region in the coupling region to adjust the first and second coupling lengths (Paragraphs 53-55).

Claim Rejections - 35 USC § 103

30. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

31. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thanyavarn.

32. Regarding Claim 3, Thanyavarn teaches an apparatus with a great degree of coupling flexibility in a directional coupler area (Figures 3A and 3B).

33. Thanyavarn is silent as to whether the apparatus has bi-directional propagation of the optical beam through the first and second optical waveguides.

34. However, most optical devices are bi-directional. In the configuration of Thanyavarn, the directional couplers can be configured to accommodate a variety of coupling requirements by varying the degree of coupling of an optical signal through the directional coupler arms (Paragraph 48). Due to the flexible nature of the device, it follows that the device can be configured to operate in the reverse. This is especially beneficial when setting up the device during fabrication steps. If the device is designed to operate bi-directionally, the importance of orienting the substrate in a particular direction is lessened.

35. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the flexible device of Thanyavarn bi-directional so that fabrication tolerances with respect to substrate orientation can be lessened.

36. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thanyavarn in view of Li (US 5,502,781).

37. Thanyavarn teaches a method for switching using directional polarization optical switches (300) in a semiconductor layer having modulators (area 344) and splitting and combining switching regions (areas 342 and 346) (Figures 3A and 3B). The method provides a polarization insensitive way to ensure an input signal reaches a particular output (Paragraph 48) with low crosstalk (Paragraph 106).

38. Thanyavarn fails to teach the method further comprising: directing the first polarization mode of the first optical beam into a first 1x2 optical switch disposed in the semiconductor material layer; directing the second polarization mode of the first optical beam into a second 1x2 optical switch disposed in the semiconductor material layer; combining a first output from the first 1x2 optical switch with a first output from the second 1x2 optical switch; and combining a second output from the first 1x2 optical switch with a second output from the second 1x2 optical switch.

39. Figure 10 of Li teaches an optical switching system using directional couplers (600) to provide a system where an inputted optical signal can be outputted on one of several outputs with low crosstalk (Column 12, line 65- Column 13, line 21; see especially article to Padmanabhan cited therein). Figure 10 allows the substitution of one of several different style of directional coupler to achieve a network routing goal (Id.).

40. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to arrange the directional coupler of Thanyavarn as taught by Li in order to achieve a network routing goal (Li, Column 12, line 65- Column 13, line 21; see especially

article to Padmanabhan cited therein) that is also polarization insensitive (Thanyavarn, Paragraph 48). The resulting method of switching would have a polarization beam splitter (342) in communication with modulators (in area 344) and additional optical switches (300) after an initial coupler 346 that are eventually in communication with another polarization combiner (346) as set forth in Li, Figure 10. [Examiner notes that Claim 18 can be interpreted as directed to non-elected group II. However, it is dependent upon elected claim 11. There is no antecedence to show whether the claim is or is not properly elected. If the switches are meant to be after the modulator, they are properly part of Group I, and have been interpreted as such for examination purposes. However, if the claim is directed to Group II, it will be withdrawn from further consideration.]

Allowable Subject Matter

41. Claim 13 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

42. The following is a statement of reasons for the indication of allowable subject matter: Claim 13 contains allowable subject matter for at least the reason that the prior art of record fails to teach or fairly suggest a method comprising directing first, second and third optical beams into a coupling region defined in a semiconductor material layer such that a first polarization mode of the first beam enters a first waveguide, a second polarization mode of the first beam enters a second optical waveguide and a first polarization mode of the second optical beam is combined with a second mode of a third optical beam into unpolarized light as claimed.

43. The prior art of record does not discuss the beam combinations as claimed.

Conclusion

44. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Article to Padmanabhan is cited for applicant's convenience in understanding the networking goals of Li.

45. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krystyna Suchecki whose telephone number is (571) 272-2495. The examiner can normally be reached on M-F, 9-5.

46. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

47. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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EDWARD J. GLICK
SUPERVISORY PATENT EXAMINER